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REPORT
OF THE
GEOLOGICAL SURVEY & CONDITION
OF THE
GAP MINING COMPANY'S PROPERTY,

Lancaster County,

PENNSYLVANIA.

BY

PROF. MONTROVILLE WILSON DICKESON, M. D.,

OF PHILADELPHIA,

Member of the American Association for the Promotion of Science ; the Academy of Natural Sciences of Philadelphia ; the Society for Developing the Mineral Resources of the United States, &c., &c.

PHILADELPHIA:

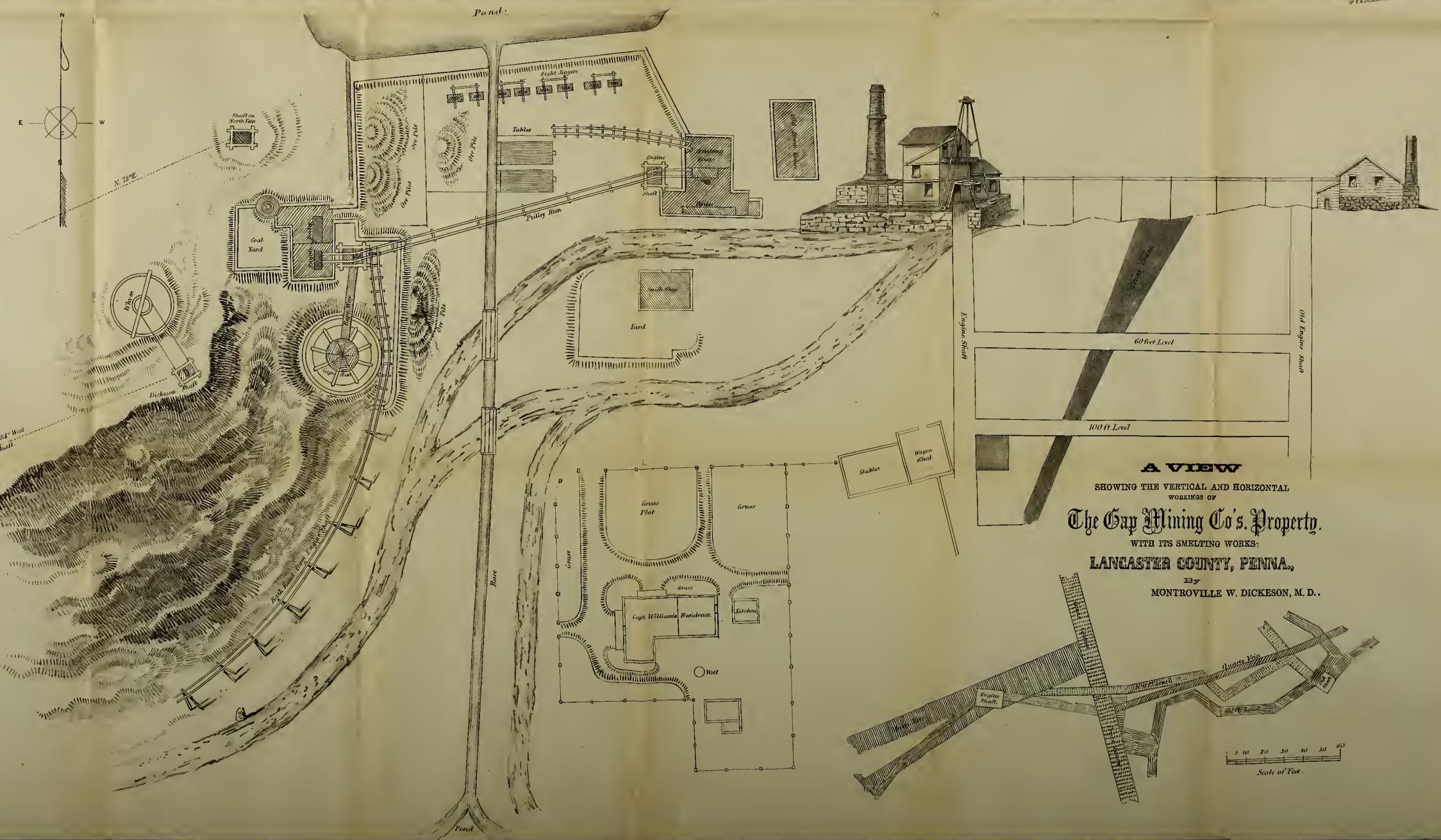
J. B. CHANDLER, PRINTER, 306 & 308 CHESTNUT STREET, [GIRARD BUILDING.]

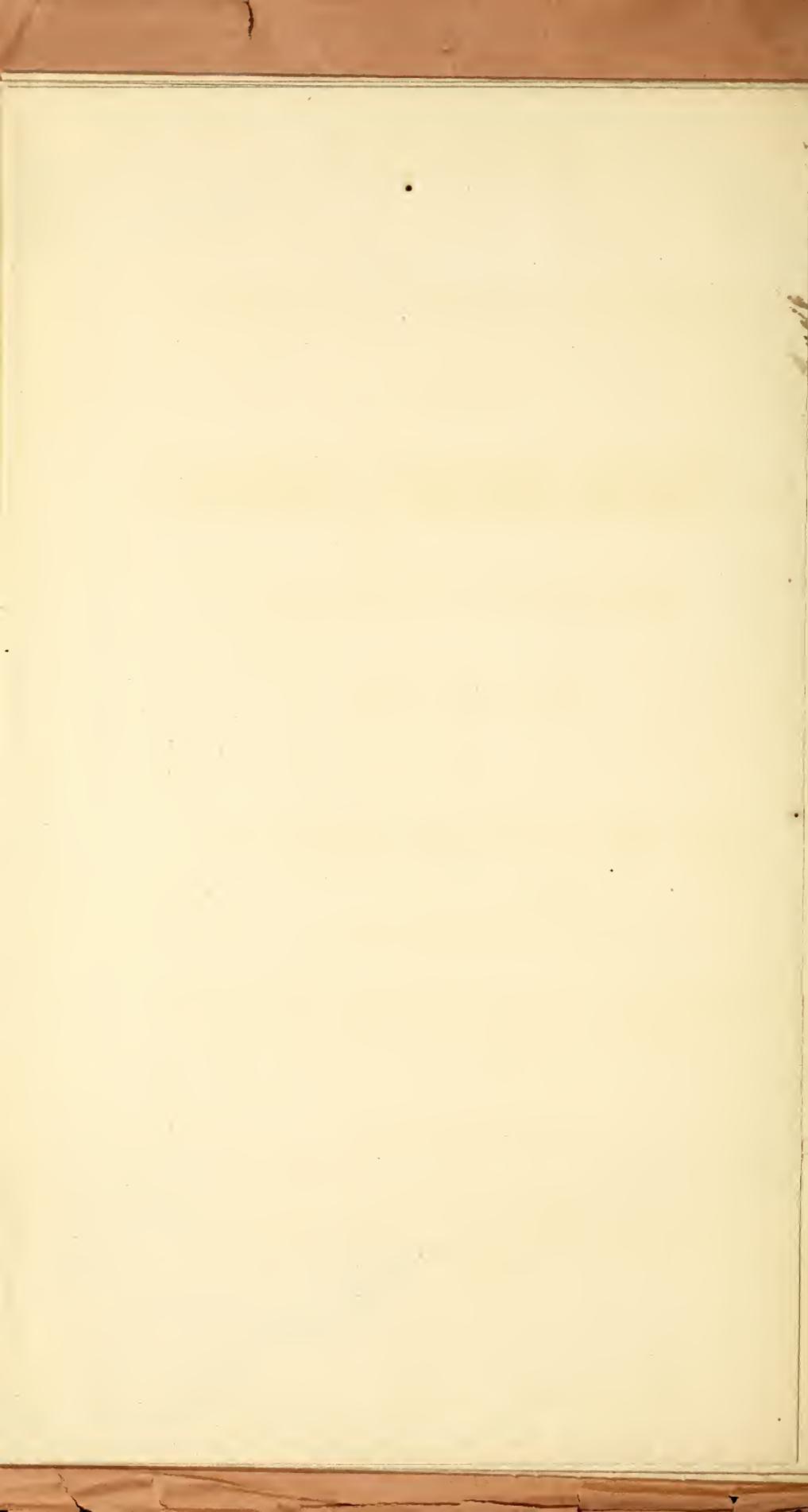
1860.











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A very faint, light-colored watermark of the Parthenon in Athens, Greece, is visible in the background of the page. The image shows the classical architecture of the temple, including its columns and pediment.

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GAP MINE, LANCASTER COUNTY, PENNSYLVANIA.

To the President, Directors, &c., of the
Gap Mining Company.

In pursuance of your authority, I have given to your property, situated in Lancaster County, and State of Pennsylvania, a critical, geological survey, the report of which, as herewith presented, is the result of two visits made in May and June of this year, which were occupied in acquiring such information in regard to its condition and economy, as would enable me to arrive at correct conclusions in relation to its merits, necessities and future prospects.

With that view admeasurements were taken, the workings thoroughly examined and comprehended, with reference to elucidating the ground plans and different sections of the Mine at every working level, as well as a whole. I investigated very closely, so far as the excavations have been made, the attendant circumstances of the interruption of the lode both north and south, for the purpose of defining the extent of the lateral

heaves, and, hence, determining the probable point where the continuity of the mineral lode might be expected to be resumed in its original integrity.

Proper attention does not appear to have been directed, heretofore, to the observance and comprehension of this important feature in the local formation, and hence it became necessary to investigate thoroughly the mining economy of the property, that errors might be corrected, and labor intelligently applied hereafter.

I am not familiar with the past productive results of your Mine; its future, however, has engaged my attention, as this valuable property should be so understood and wrought, if practicable, as to increase its mineral products—the past being of slight significance in comparison with the future, which I trust will be as prosperous as the resources of this property seem to warrant.

All mines are subject to variations in the size, contents, and hence, value of their lodes. In these particulars your mine is not singular, as it is attended with only the ordinary modifications incident in a greater or lesser degree to all mines.

It is my well-considered opinion, that taking into consideration the entire mineral contents of the two lodes on your property—from the surface down to the lowest levels—the mineral capacity is greatly increased in the descent, and that the tendency is to further enlargement as depth may be attained.

A material change in the character of the lode, is observable in the lower portion of the Engine shaft, and still a further modification may occur at a lower depth. This should excite no apprehension, as no mineral land has yet been discovered, so far as my knowledge ex-

tends, in which, in shafting from the surface to a depth of two hundred feet, what is denominated as "hard ground" is not encountered, to disturb in a measure, either the regularity of the vein or the equality of the ore.

At the greatest depth at which the excavations have been made, I find the vein divided north of the main shaft, by an irregular mass of elevated quartz, occupying a longitudinal position between the parts, the effect having been to distribute its contents in the form of strings, between which *prills* of the sulphuret of copper are found. Near the cross-cut at this particular locality, a compact horn-blend rock also makes its appearance, which occupies a position parallel with the quartz, and throws the lode entirely out of place. The intrusion of this irregular mass has, also, divided the lode into a number of fissures, which, though it does not seriously diminish the quantity of mineral matter, has produced such distortion and derangement as to render mining more difficult and expensive.

The mass of dark colored mineral matter that also shows itself, indicates the previous action of great heat, it being not only porous and spongy like scoria, but particularly irregular otherwise, in its formation. Even the walls in contiguity with it are broken and irregular, and the dark horn-blend matter is mixed with it.

In this connection, the probable character of the vein in the main shaft, at a further depth of from fifty to one hundred feet is renewed. I will say, it being the result of my experience, that the circumstance of the intrusion of a mass of quartz and horn-blend rock, disturbing the regularity of the lode or even placing it a

short drifting distance from its legitimate position in the shaft, is no reason why it should not again resume its wonted place in depth, and, as often occurs, even be increased in the quantity and quality of its mineral matter. But whether in nickel or copper, must depend for solution upon the practical development hereafter in working it; the indications, however, from the various openings favoring the existence of the former.

Any speculation relative to the value of this lode at a lower depth than reached, however, would be useless; still I must contend there is no basis for a supposition that its intrinsic value will be less than is now exposed and available, notwithstanding that by the convergence of the two lines of heave, the vein is slightly contracted longitudinally.

From extended examinations beyond the practical workings on this property, I recommend an extension south-west, on the range of veins now being wrought, the continuation of the lodes of which, are easily traced by the *gossan*, and the out-crop of the walls throughout the whole length of the property.

Upon this out-crop several prospective shafts have been sunk, in every instance the lode has been struck and found to maintain its full width—the ground being perfectly regular in formation; and hence, from the extent of vein thus exposed, the conclusion that a large and important accession to the products of the property will be realized, is warranted.

To observe a commendable prudence at this time, I do not think it judicious, however advantageous might be the result in case of success, to attempt to compass from below the course of the lateral heave, east or west

as the case might be, with the view of re-acquiring a knowledge of the mineral vein which has been interrupted by it; as that can be ascertained by developing the property in the more regular ground on its southern boundary, the point where the main shaft on the property should have been originally located; and where, from the indications, the mineral formation is very extensive. And at the same time, while thus solving a matter of so much interest in connection with this mine, you possess an abundance of good ore, developed by the sinking of the Dickeson shaft as I directed, which is thirty-seven feet in depth, with a lode eight feet in width, and can be successfully and profitably wrought; it being my opinion that the further sinking of the Engine shaft at present, would not be attended with advantages proportionate to the expenditure required.

GEOLOGY.

The rocks intersected by the veins in the locality of this mine belong principally to the *granite* and *sienite*. On the highest portion of the hill the formation is an altered sand-stone, but as the edges are approached, it gradually assumes the character of a *horn-blendic* granite. On the side of the hill in a southern direction, the *sienite* makes its appearance, and some two thousand feet beyond a trap dyke intrudes.

The vein-stone or gangue is of a variety of formations, the chief of which is horn-blend, called *actinolite*.

The nickel ore is found principally in combination with iron and magnetic pyrites, and always richer and purer in the immediate neighborhood of the foot-wall, while copper-ore occurs chiefly in the vicinity of the hanging wall.

The course of the veins, after making due allowance for heaves, &c., I have decided, after a critical examination of this and the adjoining properties, to lay down as follows: the north vein, N. 75° East; south vein, N. 84° 30' East. These veins run nearly parallel to each other, separated at the east end by a distance of about ninety feet, and at the west of one hundred and thirty.

The northern vein is from eight to twelve feet wide, dipping north, and maintains a porous consistence which is peculiar to the gossan of rich metallic veins, even up to the out-crop.

MINING SITE, &c.

Few places can be found, which present superior advantages, as they relate to climate, surface, drainage, &c., &c., for mining.

The property contains about eighty-five acres, well fenced, and situated on the table lands—about three miles in width—on the top of a spur of the Octorara Mountain, which slopes into a valley of the same name on the south, and the Piqua Valley on the north, and whose base is skirted by the Pennsylvania Central Rail Road, which can be reached at four several points within a distance of from two and three-quarters to three miles, thus affording the necessary facilities for transportation.

The improvements upon the property are in good condition, eligible in location, and capacious in arrangement, and as follows: a mansion house, barn, stables, wagon house and tenant houses; engine and boiler house, smith's and carpenter's shops, boiler and crushing rooms, ore floors, gigging establishment, horse-whym, capstains, local railroads, &c., &c.

The machinery consists of a Cornish Pumping Engine of seventy-five horse power; a hoisting engine of twenty-five horse power, with crushers, hoisting machinery, &c. attached. Beside, on eleven acres of land, additional to the main property, is located an engine of twenty-five horse power, with blowers, crushers, smelting and roasting furnaces, reverbatories, &c., &c., at a cost to the Company of about twenty-five thousand dollars.

This property possesses every other necessary adjunct required by an establishment of the kind. Everything about it is organized and systematized with reference to utility and economy, being under the management of Capt. John Williams, upon whom, the timbering of the engine and other shafts, and supporting of the various levels and galleries, reflect great credit.

The smelting department is under the special management of E. W. Coffin, Esq., whose general intelligence, and critical knowledge of the processes for smelting ores, is very marked, and which ensures the most perfect results.

SHAFTS ON THE SOUTHERN LEAD.

ENGINE SHAFT.

This shaft, with an area of 10+13 feet, and divided into two compartments, is, in every particular, exceedingly well executed. It is of an imposing character, and possesses ample capacity for any demand that can be made upon it.

Its location, so near the brow of the hill, evidences a great want of ability in its selection, for, with very moderate knowledge of formations and their courses, such an error could not have been committed. While, therefore, it is inconvenient for the adaptation of the power of the engine to the shafts south of the main workings, still it can be successfully used for some time to come.

It is evident that those who located this shaft were simply directed by the old workings, upon which they sunk, without knowledge or regardless of consequences. The great width of the ore gave them a very abundant supply, and to a considerable depth in the shaft, before either wall was reached.

After years of stoping, and the taking of an immense quantity of ore from this shaft, I find that the increased inclination of the vein, and, also, the general stratification are placed too low for easy working. Judicious management, however, may surmount this difficulty for some time to come.

This shaft was sunk through a series of ancient rock formations, belonging to the *granitic* and *sienitic* class, occasionally varied by masses of a bluish-green *chloritic*

slate, *actinolite*, pyrites, &c., &c., with here and there a small admixture of copper. No *stratum* of quartz was encountered, except as intermixed with the mineral lode, until a depth of one hundred and fifty feet had been obtained, at which point the huge mass of quartz came in from the south, and displaced or deranged the vein in the northern portion of the shaft. This quartz was succeeded by a similar mass of horn-blend rock, more or less impregnated with nickel, the sulphuret of copper, and occasionally the pyrites of the carbonate of iron. From the place in the shaft, where the quartz made its appearance, down through the horn-blend rock, as far as penetrated, is about fifteen feet, at which depth the sinking was suspended, the whole depth reached being one hundred and sixty-five feet.

The form in which the quartz enters the shaft gives the lode the appearance of being divided, but, from the position of the underlie, there is every indication of union again below at no very great depth.

One hundred and thirty years ago, at the precise location of this shaft, this mine was first opened and worked for copper ore. The lode is now reached by a vertical shaft, which, as previously stated, has been sunk to the depth of one hundred and sixty-five feet.

At a depth of sixty feet in the same, there is a gallery three hundred feet in length, following the course of the ore the whole distance, where the lode is divided into four branches.

At about one hundred feet in depth in the shaft is a wide cross-course, which, at its intersection with the lode, shows, principally, the sulphate of iron and *actinolite*.

At a point rather below the sixty feet level, the lode

presents the sulphuret of nickel, which gradually increases in richness down to the depth of about one hundred feet, where it gives a rich body of nickel ore, upward of twenty-five feet wide, where the principal gangue stone is horn-blend, which decreases in quantity with distance, the nickel ore being proportionally augmented.

Toward the west end, at a depth of one hundred and twenty feet, the lode is of immense volume, and has yielded, as I am informed, eighteen tons of good nickel ore to the cubic fathom.

The one hundred and thirty feet level has been drifted some forty-six feet, chiefly through the sulphuret of iron, which contains a nickel ore of good per-centage. Toward the end of this drift, a hard, dark rock, extending upward of twelve feet, was struck, when the sulphuret of iron and nickel again came in, and continued on to the Dickeson Shaft. This very important connection, will not only supply facilities for securing the very large body of ore remaining between the sixty and one hundred and thirty feet levels, but give free ventilation to the mine, and accelerate its extension to the west.

A cross-cut has been extended north of this shaft at the depth of one hundred and forty-seven feet, in order to encompass the north vein. Fifty feet of this working passed through chloritic slate, thence through a horn-blend rock forty-five feet, the whole containing more or less of nickel ore. Then fifty feet of an alternation of quartz and slate was surmounted, which terminated at a water-course or large fissure, that assisted in draining off the water from the western portion of the north vein. Capt. Williams then judiciously determined to fall back

on the hornblend rock, and pursue a westerly course, which, at a distance of twenty-five feet, brought the drift into what has proved to be a large lode of good nickel ore. The disturbance here, by the quartz and hornblend rocks, renders this ground somewhat difficult to mine, though the nickel ore obtained is very compensatory in quality, being, by the analysis of E. W. Coffin, Esq., $4\frac{3}{5}\%$ per cent. of metallic nickel. The wall rock has lately been reached on the east, which establishes it as the north lode, struck on its westward course. This is also confirmed by the fact that it drains the water from the Millerite, the extreme western shaft on this lode.

DICKESON SHAFT.

This shaft is located some ninety feet south, and next in range of the engine shaft, four by six feet in diameter, well timbered in its upper portion, sunk to the depth of one hundred and thirty-six feet—the rocks passed through being very decidedly metal-bearing in their whole character—and worked by a large and well constructed horse-whym.

The nickel ore commenced making its appearance in this shaft at a depth of about ninety feet, several feet below which a considerable quantity of the sulphuret of copper was perceptible among the other ores. Here, water came in quite freely, which caused the suspension of sinking for a short time—a windlass being unequal to the task of freeing it. To facilitate operations during the erection of more powerful machinery, miners were

placed in the west end of the one hundred and thirty feet level, immediately under the shaft, and, directed by the accurate dialing of the Mining Captain, shafted upward, thus penetrating the ore bed—composed of the sulphuret of iron—which, being porous, permitted the water to pass down into that level, and thence into the engine shaft. This permitted the resumption of the sinking, and the working from above and below, speedily brought the shaft down to its present depth.

From the point in the shaft, where the nickel ore was first struck, down to its present depth, about forty feet, it is fully nine feet in width, and no wall being yet reached, it is reasonable to anticipate that drifting will very soon disclose a body of nickel ore, far surpassing in quantity and richness any discovery yet made upon this or any other property in the United States.

A level has been extended east from this shaft for a distance of some thirty feet, for the purpose of compassing the large quantity of ores found in the sixty feet level, which I am pleased to say has been attended with complete success.

From the particular and general appearance of the formation of the workings, the position of the ore and its quantity and quality, it is my deliberate opinion that the development so far in this shaft, is the beginning of an entirely new deposit of rich nickel ore of great magnitude, and for which there is no parallel even in the upper workings of the Engine shaft, which at the time had no equal in our country. It being, also, my opinion that the same body of ore will be reached on the west, in the one hundred and thirty feet level from the Engine shaft, upon which the workings were

suspended to supply room and ventilation for the upward shafting to meet the downward workings in this shaft.

UDY SHAFT.

This shaft is the third on the line of the out-crop of the southern lode, and is situated three hundred and fifty feet west of the Engine shaft. It is supposed to have been one of the original openings made about a half a century anterior to the Declaration of American Independence, and was sunk to the depth of forty feet. A few years ago operations were resumed at the point of suspension, and the sinking prosecuted to the further depth of fifteen feet, making the whole depth of shaft at this time, fifty-five feet.

The first formation passed through was quite soft, being chloritic slate and several feet in depth. The cap-rock following and lying immediately under, is composed of hornblend and quartz, completely charged with crystals about three inches in length, and pebbles varying in size from a pea to a walnut. This formation extends to a depth of thirty-five feet, whose underlie appears to be one foot and a half to the fathom, northward. Here, the ore comes in and continues down to the entire depth of the shaft.

At this point, a number of small veins of quartz occur, passing through the lode, and frequently carrying prills of the sulphuret of copper, which yield some sixteen per cent. of pure metal.

I consider this distribution of the quartz as a favor-

able indication of mineral product at a lower depth, for in no instance in my experience where it occurs in metaliferous veins, have the workings been otherwise than profitable.

There are no reasons that have come under my observation for the abandonment of this shaft, as the quantity of ore is certainly sufficient to have induced progress, the width being nine feet. It is probable that the large quantity opened in the Engine shaft at that period, engaged the whole time and facilities of the owners of the property.

Several other openings have been made on this lead which are now filled up, this being the last shaft of any importance on the southern lead. The out-crop is very plain and perceptible throughout its whole course. It makes quite a curve as it approaches the west, but subsequently becomes more regular. I made a particular examination of its course, which I found to be N. $84^{\circ} 30'$ East, between this and the Engine shafts, but changing to N. 75° East, and so continuing through the adjoining property owned by Lewis Cooper, Esq.

SHAFTS ON THE NORTHERN LEAD.

NORTH SHAFT.

This shaft is sunk on the east end of the northern lode, about ninety feet north of the Engine shaft, six by ten feet in diameter, seventy-five feet in depth, and well timbered. The ground through which the shaft passed is said to be very hard, no doubt influenced by

the underlieing quartz which is met with in the Engine shaft.

A vein was found in this shaft dipping north, and though the ore was productive, it did not yield well in nickel.

In the forty feet level in this shaft, about four hundred and eighty feet west of the point where ore was discovered in the one hundred and forty-seven feet level in the Engine shaft, some limited developments have been made which show the vein to be improving in the character of its ores. A considerable quantity of "Millerite" was found lying in plates between the beds and fissures of the vein.

This lode has been explored a distance of over nine hundred feet, and ore found at every point opened.

This shaft may subserve a useful purpose as an air-shaft; but, if it can be dispensed with, I should recommend that the timbering which is superior, be taken up and appropriated at the Millerite shaft, where any reasonable improvement or expenditure will prove remuneratory.

MILLERITE SHAFT.

This is the extreme western shaft on the northern lode, and it derives its name from very beautiful specimens of sulphuret of nickel, arranged by a very delicate capillary crystallization, and known as capillary pyrites or millerite, containing sulphur 35.1, nickel 64.9—100.

It was discovered here by Prof. E. U. Shepard, who collected a large quantity of very beautiful specimens, with which he has supplied mineralogists and collectors throughout the United States.

The shaft is sunk to the depth of forty feet, has not yet been timbered, but owing to the adhesiveness of the upper formation for some depth from the surface, it is very well preserved.

The gossan was struck at a depth of six feet, and at sixteen feet the pyrites were reached. Here, the vein appears to be regularly defined with an underlie of two feet to the fathom.

Some twenty feet east of this shaft a large bed of the porphyritic sand-stone occurs, which resembles the *Elvin* of Cornwall, England, a formation hailed by the English miner as a harbinger of great success, and as occurring only in the vicinity of rich mineral beds. So far as this locality is concerned, I am prepared to endorse the truth of the theory, as every indication warrants its practical realization.

The formation at the surface of the shaft presents a granular texture, but in its descent it becomes much more compact, slaty, and darker in color. When exposed to the surface it decomposes thoroughly, and forms a deep blue-colored earth.

From every indication in connection with the surface or the formation in the shaft, there cannot be the slightest doubt of a great abundance of rich nickel ore.

The gossan crops out north and south of this shaft, upward of twenty-five feet in width, and fully equal in its character to any ever presented in an iron lead. Its decomposition forms a fine brown pigment.

This location I have determined is, and so pronounce it to be, the richest portion of the whole property. It should have been the nucleus of its mining operations.

The ore here lies very shallow, and it invites immediate development, the whole ground being very rich in mineral ore, and guaranteeing such results as will be satisfactory.

RESUMÉ.

A mineral property containing about eighty-five acres, well fenced, and approached by the Pennsylvania Central Railroad at a number of points so nearly, as to afford the necessary facilities for transportation.

The improvements are eligible in location, liberal in construction, and in excellent condition, consisting of a manor and tenant houses, barn, stables, wagon-house, smith's and carpenter's shops, boiler and crushing rooms, ore floors, gigging establishment, horse-whym, capstains, local railroads, &c., &c.

A cornish pumping engine of seventy-five horse power; a hoisting engine of twenty-five horse power, with the necessary machinery attached for hoisting and crushing.

An engine with twenty-five horse power, with blowers, crushers, smelting and roasting furnaces, reverbatories, &c., &c., costing some twenty-five thousand dollars, which is located on a body of eleven acres of land, contiguous and additional to the main property, which em-

braces, in fact, every necessary adjunct required for successful mining.

The engine shaft, 10+13 feet in diameter, divided into two compartments, and well timbered, is of immense capacity. Its location was unfortunate, in view of a continuously economical arrangement, as the application of the power of the engine to the shafts south of the main workings, though practicable for some time in the future, will not be of very long duration. Its depth is, vertically, one hundred and sixty-five feet. At a depth of sixty feet, there is a gallery three hundred feet in length, on the course of the ore the whole distance. Below the sixty feet level, the lode is charged with the sulphuret of nickel, which gradually increases in richness to the depth of about one hundred feet, when it gives a body of rich nickel ore, upward of twenty-five feet wide, the principal gangue stone being horn-blend, which decreases in quantity with distance, and the nickel ore proportionally, augmenting. The lode shows itself in immense volume at one hundred and twenty feet, and is said to yield eighteen tons of good nickel ore to the cubic fathom.

At a hundred feet there is a wide cross-course, which, at its intersection with the lode, presents, principally, the sulphate of iron and *actinolite*.

The one hundred and thirty feet level has been drifted forty-six feet, chiefly through the sulphuret of iron, which bears nickel ore of good per-cent. Toward the end of the drift, a hard, dark rock, extending upward of twelve feet, was struck, when the sulphuret of iron and nickel came in, and extended continuously to the Dickeson Shaft. This important connection ren

ders the large body of ore remaining between the sixty and one hundred and thirty feet levels available, and will supply the mine with ventilation, and accelerate the extension west.

A cross-cut has been made north of the shaft, at a depth of one hundred and forty-seven feet, for the purpose of compassing the north vein. Fifty feet of this working passed through chloritic slate, then through horn-blend rock forty-five feet, the whole containing more or less of nickel ore. Then fifty feet of an alternation of quartz and slate was surmounted, which terminated at a water-course or large fissure, which assisted in draining off the water from the western portion of the north vein. Subsequently the horn-blend rock was fallen back upon, a western course pursued, which, within a distance of twenty-five feet, brought the drift into good nickel ore. Though the ground here is not easily worked, yet the ore obtained is very compensatory, being as per analysis of E. W. Coffin, Esq., $4\frac{3}{10}\frac{6}{10}$ per cent. of metallic nickel. The wall rock has been reached by this drift on the east, which establishes it as the north lode on its western course. This is also confirmed by the fact that it drains the water from the Millerite, the extreme western shaft on this lode.

The Dickeson Shaft, ninety feet south of the engine shaft, 4+6 feet in diameter, well timbered in its upper portion, sunk to the depth of one hundred and thirty-six feet through rocks very decidedly metal-bearing in character, is worked by a well-constructed horse-whym.

The nickel ore came in at a depth of about ninety feet; several feet below a considerable quantity of the sulphuret of copper made its appearance. From the

point where it was first struck, down forty feet, to its present depth, it is fully nine feet wide, and as no wall has yet been reached, I confidently anticipate that drifting will speedily disclose an immense body of nickel ore, unequalled in quantity or quality by any development yet made within the limits of the Union.

A level has been extended, east from this shaft some thirty feet, for the purpose of reaching the large quantity of ores in the sixty feet level, and which I am pleased to say has been accomplished.

From the character of the formation in the workings, hence the position of the ore and its quantity and quality, I am decidedly of the opinion that the development in this shaft is an earnest of an entirely new deposit of rich ore, of great magnitude; and that the same body of ore will be struck on the west, in the one hundred and thirty feet level from the engine shaft.

The Udy Shaft is the third on the line of the out-crop, supposed to have been one of the ancient workings. Operations were resumed upon it, a few years ago, fifteen feet sunk, which carried it down to a depth of fifty-five feet.

The first formation passed through was chloritic slate, and quite soft. The cap-rock, succeeding, is composed of hornblend and quartz, completely charged with crystals, which formation extends to the depth of thirty-five feet, the underlie one and a half foot to the fathom, northward. Here, the ore comes in, and continues the whole depth of the shaft.

A number of small quartz veins occur here, passing through the lode, and frequently carrying prills of the sulphuret of copper, which yield some sixteen per cent.

of pure metal. This distribution of the quartz into strings, is a favorable indication of mineral product at a lower depth, for wherever it occurs in metaliferous veins, the workings are uniformly profitable.

There is no reason for the abandonment of this shaft, as the quantity of ore would have warranted—the width being nine feet—its continued working; though it is probable that at a very early day, the quantity of ore opened by the engine shaft, required the entire facilities of the owners of the property.

Several other openings, now filled up, have been made on this lead, the outcrop of which is very plain and perceptible throughout its whole course, which I established after a careful examination, to be N. $84^{\circ} 30'$ E, between this and the engine shaft, but changing to N. 75° E, and continuing on through the very valuable property adjoining, owned by Lewis Cooper, Esq.

The north shaft is sunk on the east end of the northern lode, about ninety feet north of the engine shaft, six by ten feet in diameter, seventy-five feet in depth, and well timbered. The ground passed through is said to be very hard.

A vein was found in the shaft, dipping north, and though the ore was productive, it did not yield satisfactorily in nickel. The lode has been explored a distance of nine hundred feet, and ore found at every point opened.

In the forty feet level in this shaft, some limited developments have been made, which show the ore to be improving in its character.

This shaft may subserve a useful purpose as an air-

shaft, but if it can be dispensed with, I recommend the timbering to be taken up and used at the Millerite shaft; as there, ample remuneration will follow improvement.

The Millerite shaft is the extreme western shaft on the northern lode, is sunk to the depth of forty feet, not yet timbered, but, owing to the consistence of the upper formation for some distance down from the surface, is well preserved.

The gossan was struck at a depth of six feet and the pyrites at sixteen, the vein being regularly defined with an underlie of two feet to the fathom.

The formation at the surface of the shaft is of a granular texture, but in descent it soon becomes more compact, slaty, and darker in color. When exposed it decomposes and forms a deep-blue colored earth. The surface and formation in the shaft prove beyond doubt, a great abundance of very rich nickel ore.

The gossan crops out north and south of the shaft upward of twenty-five feet in width, and is equal to any ever presented in an iron lead.

This location is the richest portion of the property, and it should have been selected as the nucleus of its mining operations.

The ore lies shallow and invites immediate action, the whole ground being so very rich in mineral ore as to warrant satisfactory results.

All the appointments of this property are of a superior character, and its general management evidences an intelligent economy; but, in conclusion permit me to say, that ample means are indispensable to the success of such an establishment.

To be incapacitated by restriction of facilities for adopting whatever change in the workings experience may dictate, or improvements in any economical arrangements a sound policy may suggest, is to struggle against disadvantages; while at the same time those who occupy official posts—passive sufferers are from such a cause incapable of remedying that for which they are often censured.

This is the grand secret of the want of success of mining in our country, and it will continue to be operative till working capital is amply provided as in older countries. Then, with our vast mineral resources existing in such favorable contrast with the comparatively exhausted mines of older countries, mining in this country will become as nature intended it should, profitable.

As a whole, as my report shows, your property is very valuable, the principal deduction from this premise, being the unfortunate location of the engine or main shaft. Taking the property as it is, however, and conceding the necessity for the re-location of that shaft—by-the-bye unnecessary for some years—it would not, in view of the development at the Dickeson and Millerite shafts, materially diminish its value, for, rich as I have shown it to be in nickel ores, the future, under good management and with ample capital, would very soon obliterate the memory, even, of any at present existing drawback to its value; particularly in view of the discovery by Alfred Monnier, chemist, and immediately after carefully examined and approved by Dr. F. A. Genth, of this city, of a new process by precipitation, for extracting the metal from the ore, out

which promises to effect a complete revolution in the application of means and appliances to that end.

This process is endorsed by Professor A. Snowden Piggot, M. D., of Baltimore, Md., and its practicability confirmed by practical tests made on an extensive scale by C. F. A. Simonin, chemist of this city.

With my very best wishes for the future success of your company,

Very respectfully,

Yours, &c.,

MONTROVILLE W. DICKESON,

Economic Geologist,

24 Walnut Street, Philadelphia, Pa.



